

## **Historic, Archive Document**

Do not assume content reflects current scientific knowledge, policies, or practices.



1,96  
R 31FSmo

IND/STA



United States  
Department of  
Agriculture

Soil  
Conservation  
Service

Montana  
Agricultural  
Experiment  
Station

Bozeman,  
Montana

# MONTANA WATER SUPPLY OUTLOOK

## Snowpack and Streamflow Forecasts as of

### June 1, 1983

UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

P.O. Box 98  
BOZEMAN, MONTANA 59715

OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE, \$300

THIRD-CLASS BULK RATE  
POSTAGE AND FEES PAID  
USDA - SCS  
BOZEMAN MT  
PERMIT NO G-287

National Agricultural Library  
Current Serial Record  
U.S. Department of Agriculture  
Room 002  
Beltsville, MD 20705

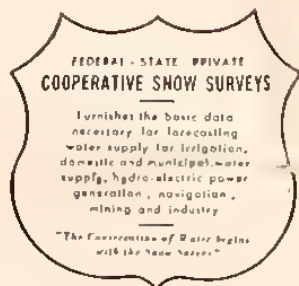


\*\*\*\*\*

The Montana Water Supply Outlook is a publication of the U.S. Soil Conservation Service. The SCS administers the Cooperative Snow Survey Program in cooperation with other federal, state and private agencies, organizations, and individuals.

The report is prepared by SCS, Snow Survey and Water Supply Forecast Staff, P.O. Box 98, Bozeman, Montana.

\*\*\*\*\*



### WARM TEMPERATURES INCREASE SNOWMELT

The last half of May was quite warm. Substantial snowmelt occurred at all elevations with a resultant increase in streamflows.

Moisture has been below average in most areas allowing the snowmelt water to travel downstream within the stream banks. Most irrigation reservoirs are full or nearly full. Irrigation has begun in most areas because of warm temperatures and lack of rainfall.

Most low elevation snow has melted. Most high elevation snowpacks have lost about one-half of the water content that was accumulated through the winter.

With the peak snowmelt runoff occurring a little sooner than usual and the below average snowpack in most drainages, mid and late season shortages of irrigation water supplies are still expected to occur in most central Montana drainages and upper drainages in the Clark Fork Basin west of the Divide.

## ACID PRECIPITATION MEASUREMENTS

Montana snow surveyors continued to obtain surface snow pH measurements this season. This is the third winter these measurements have been taken. The area of low pH, commonly referred to as "acid precipitation", extends further north than in previous seasons. Southwest Montana continues to show snowfall of less than 5.0 pH except for the Bitterroot area. The last two seasons, the Bitterroot has had low pH snow but this season it appears to be more normal. The shape of this year's low pH zone may be associated with differing storm patterns this winter.

The heavy precipitation areas were mostly south of Montana with the southwest corner of the State receiving much of its moisture from the edges of these storms. It appears from the last 3 year's data, that the low pH snowfall is being brought in from the area southwest of the State and is not directly related to activity in Montana. No decision has been made regarding pH monitoring next year. If measurements are discontinued, a summary report showing all past data will be published. Otherwise, a summary report will be prepared with the termination of pH measurements.



SNOWFALL pH STUDY  
WINTER 1982-83  
SCS SNOW SURVEY  
BOZEMAN, MONTANA





# SNOW SURVEY DATA

SNOW June 1, 1983						
DRAINAGE BASIN and/or SNOW COURSE						
NAME	Elevation	Date of Survey	Snow Depth (Inches)	Water Content (Inches)	Water Content (Inches) Last Year	Average
ARCH FALLS	7350	5/27	25	9.2	-	10.2
BADGER PASS	6900	6/01	35	18.4	50.3	41.3
BADGER PASS PILLOW	6900	6/01	SP	14.5	43.5	-
BANFIELD MOUNTAIN	5600	5/25	21	12.0	16.1	7.6
BANFIELD MOUNTAIN PILLOW	5600	5/25	SP	9.9	11.6	4.2
BARKER LAKES PILLOW	8250	6/01	SP	15.2	18.8	-
BASIN CREEK PILLOW	7180	6/01	SP	6.6	14.2	-
BEAGLE SPRINGS PILLOW	8850	6/01	SP	.0	4.7	-
BIG COULEE	5100	5/27	0	.0	-	0.5
BIG CREEK	6750	6/01	84	44.9	49.2	44.3
BLACK BEAR PILLOW	7950	6/01	SP	29.9	37.7	30.1
BLACK PINE	7100	5/25	17	7.0	10.4	4.1
BLACK PINE PILLOW	7100	5/25	SP	7.4	10.7	4.4
BLOODY DICK PILLOW	7600	6/01	SP	.0	7.5	-
BLUF LAKE	5900	6/01	0	.0	22.8	14.7
BOULDER MOUNTAIN PILLOW	7950	6/01	SP	13.7	23.0	-
BOX CANYON PILLOW	6670	6/01	SP	.0	.0	-
BRIDGER BOWL	7250	5/31	40	18.4	28.7	23.6
BRIDGER BOWL PILLOW	7250	5/31	SP	16.5	25.4	19.8
CALVERT CREEK PILLOW	6450	6/01	SP	.0	.0	0.0
CASHE CREEK PILLOW	7800	6/01	SP	2.0	5.0	-
CHICKEN CREEK	4060	6/01	0	.0	.0	-
CLOVER MEADOW PILLOW	8600	6/01	SP	10.8	18.3	-
COLE CREEK	7850	5/26	66	27.4	15.2	19.5
COLE CREEK PILLOW	7850	5/26	SP	27.2	13.1	18.6
COMBINATION	5600	5/26	0	.0	1.6	0.0
COMBINATION PILLOW	5600	5/26	SP	.2	.0	0.0
COPPER BOTTOM PILLOW	5200	6/01	SP	.0	.0	0.0
COPPER CAMP PILLOW	6950	6/01	SP	10.2	34.5	19.1
COYOTE HILL	4200	5/31	0	.0	-	-
CRYSTAL LAKE PILLOW	6100	6/01	SP	.0	5.9	-
DALY CREEK PILLOW	5780	6/01	SP	.0	.0	-
DARKHORSE LAKE PILLOW	8600	6/01	SP	18.7	35.3	-
DEADMAN CREEK	6450	5/26	0	.0	1.4	0.4
DEADMAN CREEK PILLOW	6450	5/26	SP	.0	1.3	0.0
DESERT MOUNTAIN	5600	5/25	4	2.0	3.2	1.4
DEVILS SLIDE	8100	5/27	67	27.1	-	25.5
DIVIDE PILLOW	7900	6/01	SP	.9	7.0	1.0
EMERY CREEK	4350	5/25	0	.0	.0	-
EMERY CREEK PILLOW	4350	5/25	SP	.0	.0	-
FATTY CREEK	5500	6/01	15	8.0	14.6	9.1
FISHER CREEK PILLOW	9100	6/01	SP	28.0	41.0	38.0
FLATTOP MOUNTAIN PILLOW	6300	6/01	SP	33.5	42.6	48.0
FOURTH OF JULY	3450	5/27	0	.0	.0	-
FRIDAY HILL	4620	5/27	0	.0	.0	-
FROHNER MEADOWS PILLOW	6480	6/01	SP	.0	4.0	3.1
GARVER CREEK	4250	5/25	0	.0	.0	0.1
GARVER CREEK PILLOW	4250	5/25	SP	.0	0.3	0.0
GIBBONS PASS	7100	5/31	17	8.6	-	11.2
GRAVE CREEK	4300	5/25	0	.0	.0	2.1
GRAVE CREEK PILLOW	4300	5/25	SP	.0	.0	0.0

SNOW June 1, 1983						
DRAINAGE BASIN and/or SNOW COURSE						
NAME	Elevation	Date of Survey	Snow Depth (Inches)	Water Content (Inches)	Water Content (Inches) Last Year	Average
GRIZZLY PEAK	8640	5/26	74	30.6	12.8	-
GUNSLIGHT LAKE	6300	6/01	35	19.4	42.2	35.4
HAND CREEK	5030	5/25	0	.0	.0	-
HAND CREEK PILLOW	5030	6/01	SP	.0	.0	-
HAUKINS LAKE	6450	5/25	53	28.0	31.0	24.1
HAUKINS LAKE PILLOW	6450	5/25	SP	27.0	30.5	23.5
HEART LAKE TRAIL	4800	5/30	0	.0	4.0	4.1
HERR ROARING DIVIDE	5770	5/31	21	11.2	20.4	13.6
HILLS JUNCTION	4850	6/01	0	.0	15.7	-
HIGHWOOD DIVIDE	5650	5/27	0	.0	-	0.5
HIGHWOOD STATION	4600	5/27	0	.0	-	0.0
HOOD MEADOW	6600	5/27	11	3.9	-	3.6
HOODOO BASIN	6000	5/30	54	29.9	51.1	39.0
HOODOO BASIN PILLOW	6000	6/01	SP	27.5	45.9	33.0
HOODOO CREEK	5900	5/30	52	27.6	49.4	36.5
KINGS HILL	7500	5/26	20	7.6	16.2	11.4
KRAFT CREEK PILLOW	4750	6/01	SP	.0	.0	-
LAKE CREEK	6100	5/31	0	.0	-	0.2
LAKEVIEW RIDGE PILLOW	7400	6/01	SP	.0	.0	-
LEMMI RIDGE PILLOW	8100	6/01	SP	.9	1.6	2.0
LICK CREEK	6860	5/27	7	2.4	.4	1.3
LICK CREEK PILLOW	6860	5/27	SP	.7	0.1	0.7
LOWER TWIN PILLOW	7900	6/01	SP	20.0	22.6	-
LUBRECHT FLUME PILLOW	4800	6/01	SP	.0	.0	0.0
MANY GLACIER PILLOW	4260	6/01	SP	.0	.0	-
MAYNARD CREEK	6210	5/31	0	.0	6.8	4.4
MAYNARD CREEK PILLOW	6210	5/31	SP	4.0	9.6	4.6
MONUMENT PEAK PILLOW	8800	6/01	SP	15.7	23.9	-
MOUNT LOCKHART PILLOW	6400	6/01	SP	7.3	-	13.0
MULE CREEK PILLOW	8350	6/01	SP	9.7	20.4	-
NEVADA CREEK PILLOW	6480	6/01	SP	2.9	13.3	-
NEUTON MOUNTAIN	5600	5/27	52	27.1	24.1	-
NEZ PERCE CAMP PILLOW	5650	6/01	SP	.0	3.5	-
NOISY BASIN	6040	5/25	99	44.7	48.0	43.5
NOISY BASIN PILLOW	6040	6/01	SP	35.6	40.3	31.1
NORTH Fk. ELK CREEK PILLOW	6250	6/01	SP	.0	0.6	1.6
NORTH FORK JOCKO	6330	5/29	47	25.7	59.6	29.5
NORTHWEST ENTRANCE	7400	6/03	0	.0	-	0.7
NORTHEAST ENTRANCE PILLOW	7400	6/01	SP	.0	.0	0.0
PETERSON MEADOWS	7200	6/01	0	.0	-	1.8
PETERSON MEADOWS PILLOW	7200	6/01	SP	.9	-	2.7
PICKFOOT CREEK PILLOW	6650	6/01	SP	.0	.0	-
PIKE CREEK	5930	5/26	22	11.6	-	-
PIKE CREEK PILLOW	5930	5/26	SP	9.8	27.5	-
PLACER BASIN PILLOW	8830	6/01	SP	17.6	21.4	-
PORRIAN CREEK	5100	5/25	23	12.1	25.7	11.9
PORRIAN CREEK PILLOW	5100	5/25	SP	6.6	25.8	10.3
PORCUPINE PILLOW	6500	6/01	SP	.0	.5	-
RED MOUNTAIN	6000	6/01	0	.0	6.6	5.4
RED TOP	5260	5/27	54	15.6	18.4	-
ROCKER PEAK	8000	5/31	12	4.6	14.2	10.5
ROCKER PEAK PILLOW	8000	5/31	SP	13.2	-	15.4
SADDLE MOUNTAIN PILLOW	7940	6/01	SP	19.1	31.0	22.5
SHOWER FALLS	8100	5/27	68	28.2	-	29.9

SNOW June 1, 1983						
DRAINAGE BASIN and/or SNOW COURSE						
NAME	Elevation	Date of Survey	Snow Depth (Inches)	Water Content (Inches)	Water Content (Inches) Last Year	Average
SHOWER FALLS PILLOW	8100	6/01	SP	25.3	28.2	26.2
SILVER RUN	6630	5/26	0	.0	-	1.6
SILVER RUN PILLOW	6630	5/26	SP	.0	.0	-
SKALKAHU SUMMIT	7260	5/25	44	19.4	29.8	16.6
SKALKAHU SUMMIT PILLOW	7260	6/01	SP	16.0	30.0	-
SKYLARK TRAIL PILLOW	6200	6/01	SP	10.8	32.1	-
SOUTH FORK SHIELDS	8100	6/02	51	22.5	-	-
SOUTH FORK SHIELDS PILLOW	8100	6/02	SP	16.2	-	-
SPOTTED BEAR MOUNTAIN	7000	6/01	0	.0	.3	1.2
SPUR PARK	8100	5/26	40	16.4	26.7	18.8
SPUR PARK PILLOW	8100	5/26	SP	18.6	27.2	18.2
STAIL PEAK	6050	5/25	75	38.6	35.8	35.8
STAIL PEAK PILLOW	6050	5/25	SP	35.1	31.3	30.2
STRYKER BASIN	6180	6/01	39	21.5	32.5	-
STUART MOUNTAIN	7400	5/29	48	23.0	26.5	20.2
TEPEE CREEK	8000	5/31	32	14.0	-	11.9
TEPEE CREEK PILLOW	8000	5/31	SP	8.2	12.2	5.3
TRINKUS LAKE	6100	6/01	38	21.4	34.9	27.0
TV MOUNTAIN	6800	5/29	16	7.1	13.1	11.3
TWELVEMILE CREEK PILLOW	5600	6/01	SP	.0	.0	0.9
TWIN LAKES PILLOW	6510	6/01	SP	18.9	48.0	30.7
UPPER HOLLAND LAKE	6200	5/29	31	15.0	25.9	24.8
WALDRON	5600	6/01	0	.0	-	0.0
WALDRON PILLOW	5600	6/01	SP	.0	.0	0.2
WARM SPRINGS PILLOW	7800	6/01	SP	18.7	27.7	-
WEASEL DIVIDE	5450	5/25	45	23.2	26.1	20.6
WHISKEY CREEK PILLOW	6800	6/01	SP	.0	4.1	1.7
WHITE MILL PILLOW	8700	6/01	SP	19.1	30.5	21.0
WOOD CREEK PILLOW	5960	6/01	SP	.0	.0	-

\*\*\*\*\*

## Unpublished data and corrections to previously published data

JANUARY						
Hawkins Lake	6450	12/27	54	14.5	12.2	14.6
Spotted Bear Mountain	7000	1/06	32	7.0	5.3	6.9
MID-JANUARY						
Hoodoo Basin	6000	1/13	88	29.7	31.0	--
Hoodoo Creek	5900	1/13	84	27.2	27.9	--
FEBRUARY						
Marias Pass	5250	1/30	38	12.0	15.3	12.0
MID-FEBRUARY						
Bear Paw Ski Area	5200	2/17	13	3.0	--	--
Boxelder Creek	5100	2/14	18	4.8	--	--
Hoodoo Basin	6000	2/15	99	35.5	40.5	--
Hoodoo Creek	5900	2/15	94	33.0	36.6	--

SNOW June 1, 1983						
DRAINAGE BASIN and/or SNOW COURSE						
NAME	Elevation	Date of Survey	Snow Depth (Inches)	Water Content (Inches)	Water Content (Inches) Last Year	Average
MARCH						
Marias Pass	5250	2/28	38	14.0	20.0	16.3
MID-MARCH						
Hoodoo Basin	6000	3/15	112	43.8	60.6	--
Hoodoo Creek	5900	3/15	102	41.2	56.7	--
Kraft Creek	4750	3/16	27	10.0	--	--
North Fork Jocko	6330	3/16	96	35.3	--	--
Skyline Trail	6200	3/16	70	26.3	--	--
Stuart Mountain	7400	3/16	85	29.4	--	--
TV Mountain	6800	3/16	49	15.7	--	--
Upper Holland Lake	6200	3/16	69	23.1	--	--
APRIL						
Fred Burr Pass	8000	4/01	Est	24.5	33.0	27.7
Jahnke Lake Trail	7200	3/31	39	10.8	15.7	10.5
Warm Springs	7800	4/01	Est	18.8	25.4	--
MID-APRIL						
Big Sky	7700	4/21	49	16.4	--	--
Hoodoo Basin	6000	4/14	119	50.4	70.2	--
Hoodoo Creek	5900	4/14	107	44.5	63.0	--
Lone Mountain	8880	4/21	66	25.0	--	--
Taylor Peaks	8500	4/18	61	21.8	--	--
MAY						
Rader Pass	6900	4/30	66	29.2	51.6	45.9
Blue Lake	5900	4/30	40	17.0	33.8	26.1
Northeast Entrance	7400	5/1	15	5.4	9.0	8.5
Spotted Bear Mountain	7000	4/30	18	7.5	17.3	11.7
MID-MAY						
Bear Paw Ski Area	5200	5/15	13	3.6	--	--
Picket Pin D	9450	5/14	97	30.0A	31.5	32.8
Rocky Boy	4700	5/15	11	2.8	--	0.6</



RESERVOIR STORAGE (Thousand Acre Feet) END OF MONTH May 31, 1983

Basin or Stream	RESERVOIR	Usable Capacity	Usable Storage		
			This Year	Last Year	Average
COLUMBIA					
Kootenai	Koocanusa	5,748.2	3,427.0	2,659.0	---
Flathead	Hungry Horse	3,451.0	2,879.0	2,476.0	2,523.0
	Flathead Lake	1,791.0	1,489.0	1,321.0	1,440.0
	Camas (4)	45.2	38.4	38.1	30.8
	Mission Valley (8)	100.3	85.0	53.5	59.4
Clark Fork	Georgetown Lake	31.0	26.8	26.4	25.8
	Lower Willow Creek	4.9	5.0	5.1	4.1
	Nevada Creek	12.6	12.9	12.8	11.1
	Noxon Rapids	334.6	328.3	323.9	257.0
Bitterroot	Painted Rocks	31.7	---	---	29.4
	Como	34.9	---	---	26.3
MISSOURI					
Beaverhead	Lima	84.0	68.4	78.5	68.1
	Clark Canyon	257.2	180.3	189.6	159.0
Ruby	Ruby	38.8	38.8	---	38.2
Madison	Hebgen Lake	377.5	263.4	294.3	300.3
	Ennis Lake	41.0	38.5	33.8	35.3
Gallatin	Middle Creek	8.0	7.2	6.5	6.5
Missouri	Canyon Ferry	2,043.0	1,675.0	1,629.0	1,625.0
	Hauser & Helena	61.9	63.0	63.0	60.0
	Lake Helena	10.4	10.9	10.9	9.8
	Holter Lake	81.9	80.0	71.2	77.0
	Fort Peck Lake	18,910.0	16,200.0	14,610.0	16,240.0
Smith	Smith River	10.6	11.6	16.6	10.9
	Newlan Creek	12.4	9.6	11.7	---
Musselshell	Bair	7.0	7.1	7.1	6.7
	Martinsdale	23.1	21.2	16.6	18.1
	Deadman's Basin	72.2	---	69.2	59.1
Sun	Gibson	99.1	92.3	81.6	90.4
	Willow Creek	32.2	26.2	8.2	28.3
	Pishkun	32.0	30.4	30.6	30.3
Marias	Lower Two Medicine	11.9	---	---	12.9
	Four Horns	19.2	---	---	12.9
	Swift	30.0	28.2	15.9	25.0
	Lake Frances	111.9	89.0	100.5	87.0
Milk	Elwell (Tiber)	1,347.0	772.6	683.2	642.7
	Beaver Creek	3.5	3.2	3.2	3.1
	Fresno	127.2	48.8	127.5	100.6
	Nelson	66.8	46.3	58.0	46.6
HUDSON BAY					
St. Mary's	Lake Sherburne	64.3	22.6	8.7	31.2
YELLOWSTONE					
Stillwater	Mystic Lake	21.0	2.7	2.1	5.4
Clark's Fork	Cooney	27.4	21.8	16.5	19.4
Tongue	Tongue River	68.0	39.1	27.4	47.8
Bighorn	Bighorn Lake	1,356.0	896.5	775.3	635.7

NEW AVERAGES NEXT YEAR

Next year, a new base period will be used to compute averages for comparing current snow water equivalent, precipitation, stream-flow reservoir storages, and other hydrologic and climatic indicators. The 20-year period 1961-1980 will become the new base period effective for the 1984 Water Year (WY) which begins on October 1, 1983. In WY 1988, the 1961-1985 period will be used for a 25-year base period. In 1993 WY, a full 30-year period (1961-1990) will be used. After 1993, the averages will be based on a 30-year period and will be updated every 10 years. These changes are being made to become more compatible with other agencies and organizations involved in hydrologic and climatic data collection and reporting.



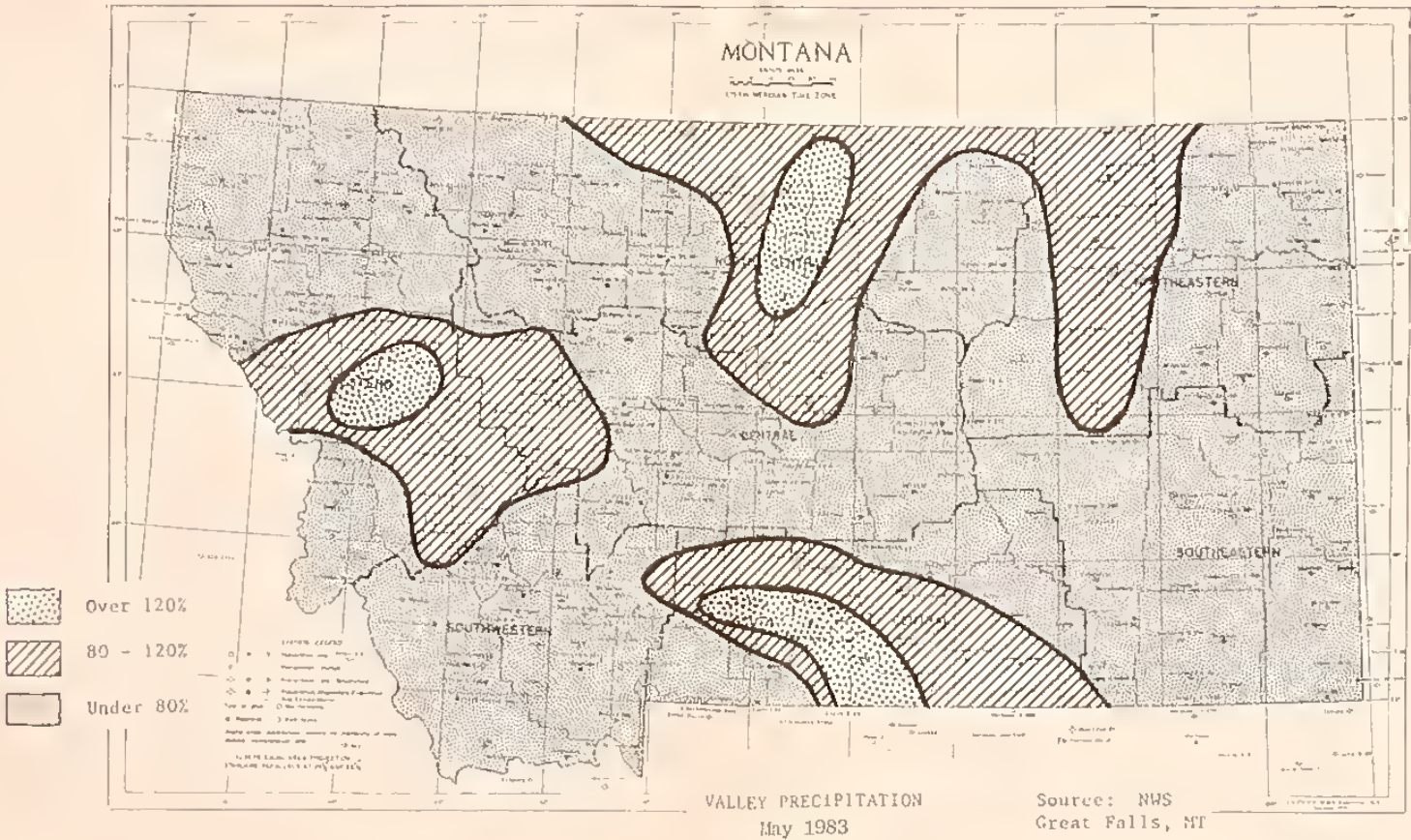
PEAK SNOWMELT RUNOFF

Warm temperatures near the end of May have induced considerable snowmelt and fairly rapid response in streamflows.

The peak had already occurred on many lower elevation headwater streams prior to this heavy melt period. The Madison and Big Hole Rivers in southwest Montana, and the Clark Fork, Blackfoot, Bitterroot, and North and Middle Forks of the Flathead, west of the Divide, had their peak snowmelt runoff at the end of May. The Clark Fork, Bitterroot and Middle Fork of the Flathead, peaked slightly higher than estimated on May 1 but all other streams had peak flows in the range forecasted. The Missouri River inflow to Canyon Ferry Reservoir should reach its peak inflow on the first or second of June.

The Gallatin River, the Yellowstone River, and its tributaries should reach their peak runoff around the 7th to 10th of June, unless cool weather postpones the melt period.

So far, precipitation has been light during peak snowmelt runoff and runoff has stayed within the stream channels.



AGENCIES AND ORGANIZATIONS COOPERATING IN MONTANA SNOW SURVEYS

GOVERNMENT AGENCIES

Canada

- Department of the Environment
- Atmospheric Environment Service
- Water Management Service
- British Columbia Ministry of Environment
- Inventory and Engineering Branch, Hydrology Section
- Alberta Environment
- Technical Services Division

Federal

- Department of the Army - Corps of Engineers
- Department of Agriculture - Forest Service
- Soil Conservation Service
- Department of Commerce - National Environmental Satellite Service
- National Weather Service
- Department of Interior - Bureau of Indian Affairs
- Fish and Wildlife Service
- Geological Survey
- National Park Service
- Bureau of Reclamation
- Department of Energy - Bonneville Power Administration

STATE AGENCIES

- Montana Conservation Districts
- Montana Department of Fish, Wildlife and Parks
- Montana Department of Natural Resources and Conservation
- Montana State University - Agricultural Experiment Station
- University of Montana - School of Forestry

PRIVATE ORGANIZATIONS

- The Anaconda Company
- Big Sky of Montana
- Butte Water Company
- Flathead Valley Community College
- Montana Power Company

Other organizations and individuals furnish valuable information for snow survey reports. Their cooperation is gratefully acknowledged.